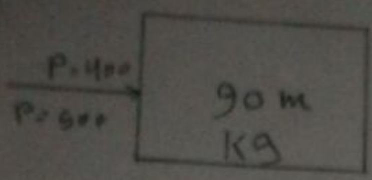
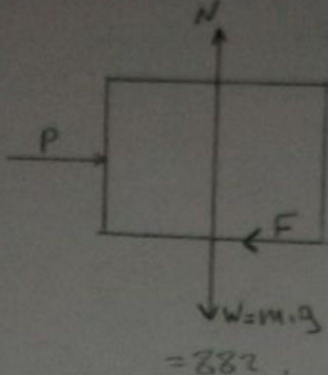
مسائل الاحتكاك

$F_s = 0.5$ $F_k = 0.4$

مسألة (1)





وضعنا الجسم الحر.

الحالة الأولى P (400)

$\sum F_y = 0 \Rightarrow N - W = 0 \Rightarrow N = W = 882$ ✓

$F_t = F_s . N = 0.5 \times 882 = 441$ ✓

$\sum F_x = 0 \Rightarrow -F + P = 0 \Rightarrow P = F = 400N$

$F < F_t$ يشير إلى أن الصندوق في حالة سكون.

الحالة الثانية P = (500)

$\sum F_y = 0 \Rightarrow N - W = N = W = 882N$

$F_t = F_s . N = 441$

$\sum F_x = P - F = P = F = 500N$

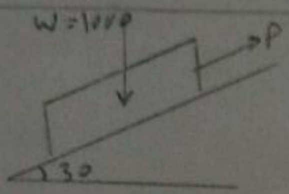
$F > F_t$ يشير إلى أن الصندوق في حالة حركة.

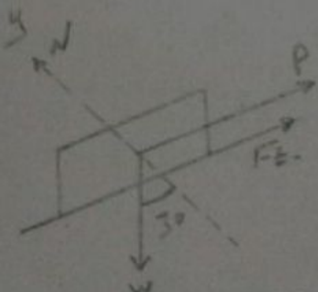
قوة الاحتكاك الفعلية

$F_k = f_k . N$

$F_k = 0.4 \times 882 = 353N$

المسألة الثانية.



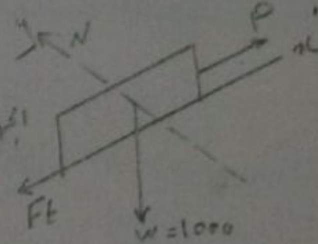


الاحتكاك للأعلى والجهة نحو الأسفل

$\sum F_y = 0 \Rightarrow N - W\cos30 = N = 866N$

$F_t = F_s . N = 130N$

$F_x = -P - F_{t_{max}} + W\sin30 = 0 \Rightarrow P_{min} = 370N$



الاحتكاك للأسفل الجهة نحو الأعلى

$\sum F_y = 0 \Rightarrow N - W\cos30 = 0 \Rightarrow N = 866N$

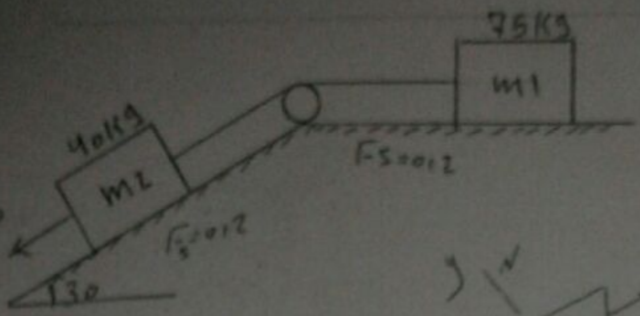
$F_t = F_s . N = 0 \Rightarrow 0.15 \times 866 = 130N$

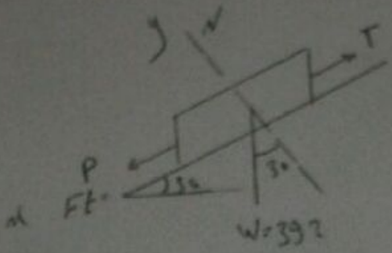
$\sum F_x = 0 \Rightarrow P - F_t - W\sin30 = 0 \Rightarrow$

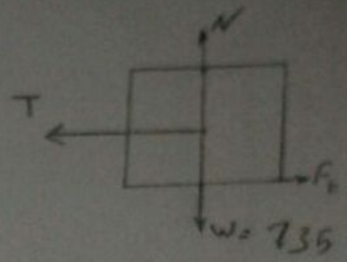
$P_{max} = 130 + 1000\sin30 = 630N$

مسائل الاحتكاك

مسألة (3)







$\sum F_y=0 \Rightarrow N-W\cos30=0 \Rightarrow N=339.4N$ ✓

$F_t=F_s.N=0 \Rightarrow 0.2\times339.4=68N$ ✓

$\sum F_x=0 \Rightarrow P+F_t+W\sin30-T=0 \Rightarrow$

$P=-117$ ✓

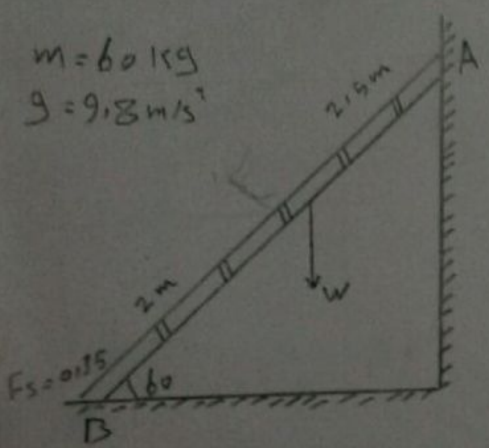
$\sum F_y=0 \Rightarrow N-W=0 \Rightarrow N=735$

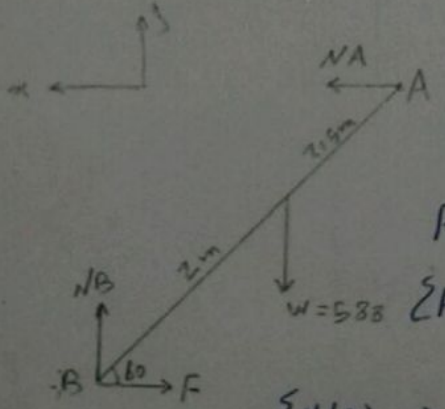
$F_{t\,max}=F_s.N=0 \Rightarrow 0.2\times735=147$ ✓

$\sum F_x=0 \Rightarrow T-F_t=0 \Rightarrow T=147$ ✓

مسألة (4)

$m=60\,kg$
$g=9.8\,m/s^2$





$\sum F_y=0 \Rightarrow NB-W=0 \Rightarrow NB=588N$ ✓

$F_t=F_s.N=0 \Rightarrow 0.35\times588=206N$ ✓

$\sum F_x=0 \Rightarrow NA-F=NA=F=151N$ ✓

$\sum M(B)=0 \Rightarrow -W.2\cos60+NA.4.5\sin60=0$

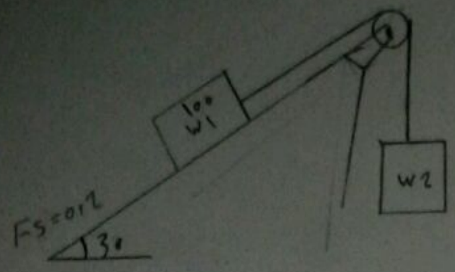
$NA=151N$ ✓

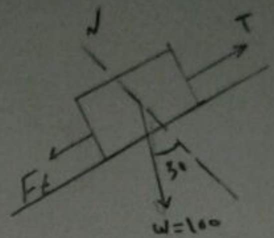
$F<F_t$

السلم يبقى في حالة سكون.

مسائل الاحتكاك

مسألة (5).



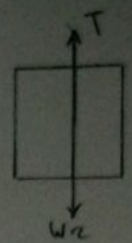


$\Sigma F_y = 0 \Rightarrow N - W\cos 30 = 0 \Rightarrow N = 86.6\,N$

$F_t = f_s \cdot N = 0.2 \times 86.6 = 17.32\,N$

$\Sigma F_x = 0 \Rightarrow -T + F_t + W\sin 30 = 0 \Rightarrow$

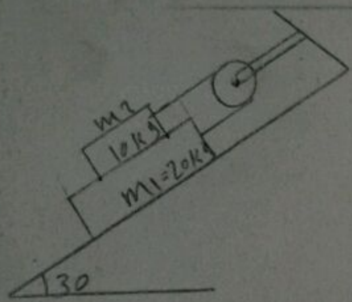
$T = 67.32\,N$

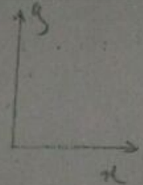


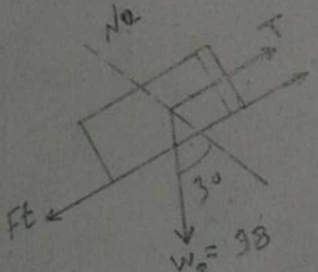
$\Sigma F_y = 0 \Rightarrow T - W_2 = 0$

$T = W_2 = 67.32\,N$

مسألة (6)





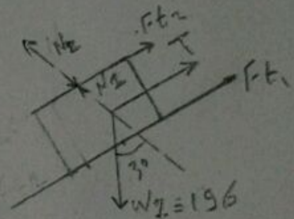


$\Sigma F_y = 0 \Rightarrow N_1 - W_1\cos 30 = 0 \Rightarrow N_1 = 85\,N$

$F_t = f_s \cdot N_1 = 0.3 \times 85 = 25.5\,N$

$\Sigma F_x = 0 \Rightarrow T - F_t - W\sin 30 = 0 \Rightarrow$

$T = 74.5\,N$



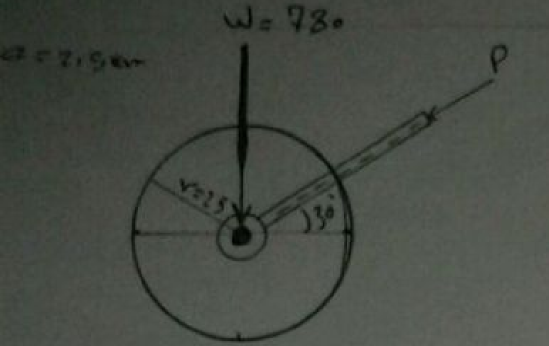
$\Sigma F_y = 0 \Rightarrow N_2 + N_1 - W\cos 30 = 0$

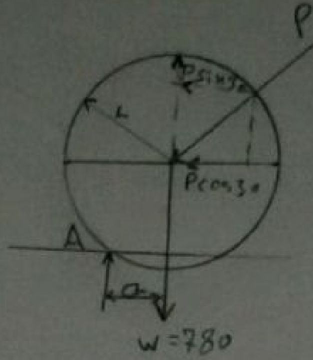
$N_2 = 85\,N$

$F_t = f_s \cdot N_2 = 25.5\,N$

مسائل الأحتكاك

مسألة (7)



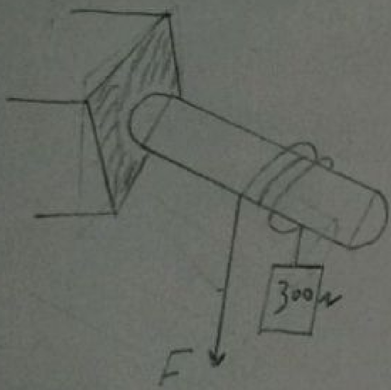


$$\Sigma M(A)=0 \Rightarrow -W\cdot a + P\cos 30 (r) + P\sin 30 (a) = 0$$

$$P = 95.6\ N$$

مسألة (8)

حيث أن: $\beta = 3\pi$ ، $T_1 = F = ?$ ، $T_2 = W = 300$ ، $F_s = 0.15$



$$\frac{T_2}{T_1} = e^{F_s \cdot \beta} \Rightarrow \frac{300}{F} = e^{0.15 \times 3\pi}$$

$$\Rightarrow F = 300 e^{-0.15(3\pi)} = 73\ N$$